U.S. PATENT APPLICATION

for

PATIENT DATA INFORMATION SYSTEM

Inventors: Roland Lamer

PATIENT DATA INFORMATION SYSTEM

FIELD OF THE INVENTION

This invention relates to medical records management systems, and more particularly to a patient data information system to integrate a Picture Archival and Communication System with a Radiology
5   Information System on a single workstation.

BACKGROUND OF THE INVENTION

Medical scanners and medical imaging machines are an integral part of modern medical practice. The scanners and medical imaging devices utilize both electromagnetic radiation and sonic wave to
10   produce images which are viewed by doctors for the diagnosis and care of patients. For example, ultrasound machines are useful for viewing fetuses during prenatal care in a pregnancy or blood flow patterns in arteries. Magnetic resonant imaging machines are useful for producing images in a wide variety of soft tissues. Computer tomology imaging
15   machines are useful for producing images of scalable structures.

In a hospital, medical scanners and medical imaging devices are preferably networked with a central image management system such as a Picture Archival and Communications System (PACS). The PACS is designed to provide a central storage for archive of medical images.
20   Further, PACS is configured so that stored images may be retrieved. Typically, a hospital will have a single PACS that is networked with a plurality of medical scanners and medical imaging devices located throughout the hospital. Further, the PACS will be networked with a plurality of image workstations, such as a PACS workstation. Images
25   generated by medical scanners and medical imaging devices are transferred to the PACS for storage and later retrieval and review by

doctors located throughout the hospital at any of the plurality of image workstations.

Also in a hospital, medical scanners and medical imaging devices are coupled to a Radiology Information System (RIS). The RIS is designed to provide a central storage for archive of patient textual data as well as information relating to the medical procedures, reports, medical orders, test results, patient demographics, etc. Further, RIS is configured so that stored textual information may be retrieved by a user. Typically, a hospital will have a single RIS that is networked with a plurality of workstations located throughout the hospital. Patient information generated at these workstations by users, such as radiology technicians, nurses, radiologists, and physicians, are transferred to the RIS for storage and later retrieval and review by radiologists located throughout the hospital at any of the plurality of RIS workstations.

A conventional PACS system and a RIS system, as explained above, are completely separate and distinct systems. Each system duplicates many of the components in each system thereby increasing the capital expenditure costs and maintenance expenses incurred by the hospital. Typically, an information exchange bridge referred to as a PACS broker, which links the two systems, can be used, but a radiologist must still access image data from the separate PACS workstation and patient textual data from the separate RIS workstation. In other words, the radiologist must have two separate workstations readily available in order to review patient images and patient textual data to completely diagnose a patient.

Thus, there is a need for a patient data information system that integrates the patient image data and patient textual data on a single workstation. There is a further need for a patient data information system that allows the user to access patient image data and patient textual data, manipulate such data as is necessary for treatment and enter new data

-2-

concerning such patient treatment in a single workstation. In addition, there is a need for a patient information system that is accessible by a plurality of users that can retrieve and input data, either textual data or image data, simultaneously.

5

SUMMARY OF THE INVENTION

The patient data information system of the present invention integrates patient image data and patient textual data and provides a method for patient data creation, maintenance and retrieval. The patient data information system comprises a display unit coupled to a workstation

10   with the workstation configured to operate a first software application which is configured to display patient images for a patient on the display unit. The workstation also is configured to work a second software application. When the first software application is configured to generate a patient context for the patient being treated and provide the patient

15   context to the second software application and display patient data from the second software application based on the patient context. The first software application retrieves patient image data from a Picture Archival and Communication System (PACS). And the second software application is configured to retrieve patient textual data from a Radiology

20   Information System (RIS) wherein the patient data includes the patient textual data. A high resolution monitor displays the patient image data and the patient textual data and the user of the present patient data information system retrieves and inputs data utilizing an input unit from a group consisting of a mouse, a voice recognition system, a keystroke on a

25   keyboard, a switch and a light pin. The second software application includes a plurality of RIS applications such as a case sign out application, a report entry application, an order detailing the application and an order viewer application.

-3-

Another embodiment of the patient data information system comprises a second workstation coupled to the workstation with the second workstation configured to operate the second software application. The two workstations are coupled via an object request

5 broker with a bridge coupled between the second workstation and the object request broker. The bridge provides a communication path for translating a Component Object Model (COM) software and a common object request broker architecture software.

The patient data information system of the present invention

10 also provides a method of integrating patient data from first and second applications comprising displaying a first set of patient data using the first application and generating a patient context for that patient. The patient context from the first application is provided to a second application and displaying a second set of patient data from the second application. The

15 method also includes retrieving the first set of patient data from an image data base and retrieving a second set of patient data from a Radiology Information System. The method further includes the step of providing includes generating an event based on a patient context and providing the event to the second application for further processing. The method also

20 includes converting the event obtained from a first object model to a second object model and providing the converted event to the second application.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an illustration of a PACS workstation and its

25 associated data base containing the present patient data information system according to an exemplary embodiment interconnected through a PACS broker to a RIS workstation and its associated data base with a plurality of modality types providing patient image and textual data to the

-4-

respective RIS and PACS databases through the PACS broker in a DICOM
gateway;

Fig. 2 is an illustration of the PACS workstation displaying
PACS application information on the workstation monitor together with
5   RIS application information displayed on the same monitor with the
patient context being transmitted from one application to another in the
background, according to an exemplary embodiment;

Fig. 3 is a block diagram illustrating the patient information
data system architecture; according to an exemplary embodiment;
10   Fig. 4 is a flow chart illustrating the process flow of the
patient data information system; according to an exemplary embodiment;

Fig. 5 is an example of an annotated window of the monitor
of the PACS workstation displaying patient data according to an
exemplary embodiment;
15   Fig. 6 is an example of an annotated window of the patient
data information system displaying patient image data and patient textual
data according to an exemplary embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Fig. 1, there is illustrated an exemplary
20   embodiment of a patient data information system (10). A workstation
(52) has a display unit (50), which can include a plurality of monitors
(54), coupled to a Picture Archival and Communication System (PACS)
and associated PACS data base (6). The data base (6) associated with
workstation (52) is in communication with a PACS broker (9) which
25   allows communication between the data base of workstation (52) and a
second data base (8) associated with a second workstation (68) and
provides access to a Radiology Information System (RIS) and its
associated RIS data base (8). The workstations (52) and (68) are also
provided with an input unit (56). The input unit (56) can include one or

-5-

more of a mouse, a voice recognition system, a keyboard keystroke assembly, a switch, and a light pen for inputting and retrieving information from the particular workstation.

The patient data information system (10) provides for integration between the applications residing on workstation (52) and third party applications residing on the same workstation or the network to which the workstation is coupled to improve work flow and productivity of patient data information. During the treatment of a patient (P) a user, typically a radiologist, will log into a workstation to obtain patient information, usually textual data as well as image data. The user will manipulate or use that information and provide additional input based on observation and analysis relating to the treatment and care of the patient based on the patient data (14) made available on the information system. The present patient data information system (10) integrates the patient image data (16) with the patient textual data (18) on the same workstation. The present patient data information system (10) provides the communication mechanism that allows different applications residing on the workstation or on the network to which the workstation is attached to share context information. The system (10) includes a conduit that allows two-way patient context exchanges between the multiple applications residing on the same workstation or the same workstation network. The patient context (12) includes, for example, patient identification data (20), user identification data (22) and patient examination information (24), etc. Patient data (14) is obtained by inputting data, either textual data (18) or image data (16) from the various modalities in which a patient is subjected during a medical treatment. Such modalities can include magnetic resonance imaging (MRI) devices or ultrasound or computer tomology imaging (CT) devices or it can include data inputted with a word processing application. Such patient data (14) is stored in either the RIS data base (8) or the PACS

-6-

data base (6) either directly through the PACS broker data base or through a DICOM gateway.

The present patient data information system (10) comprises a display unit (50) which can include one or more high resolution monitors (54) coupled to a workstation (52). The workstation (52) is configured to operate a first software application (30) configured to display patient images (16), for a patient (P), on the display unit (50) upon request by a user via an input unit (56) coupled to the workstation (52). The first application (30) is configured to generate a patient context (12) for the patient (P) and provide the patient context (12) to a second software application (32). The second application (32) displays patient data (14) from the second application (32) based on the patient context (12). In this exemplary embodiment, the first application (30) is configured to retrieve patient image data (16) from a Picture Archival and Communication System (PACS) (5) and the second application (32) is configured to retrieve patient textual data (18) from a Radiology Information System (RIS) (7) wherein the patient data (14) includes the patient textual data (18). As is mentioned above, the display unit (50) includes a monitor (54) having a resolution of at least 90 dots per inch (dpi).

During the process of operating the patient data information system (10) the second application (32) is, for example, an RIS application, such as, a case sign out application (34), a report entry application (36), an order detailing application (38), an order viewer application (40), etc. Such applications are invoked by activating a command such as by "clicking" on an icon displayed in a graphic user interface on the monitor (54) of the display unit (50) of the workstation (52) as determined by the user of the patient data information system (10). The procedure can also be invoked by the user utilizing an input

-7-

unit (56), for example, a mouse (58), a voice recognition system (60), a keyboard keystroke (62), a switch (64), and a light pen (66), etc.

Upon logging onto the workstation (52) or at another time during operation of system (10), a patient context (12) is created. The

5 patient context (12) includes the patient identification data (20) such as name, address, age, social security number, etc., associated with a specific and particular patient (P). The patient context can also include user identification data (22) such as the name, password, etc., of the user of the patient data information system (10). In addition, the patient data

10 includes patient examination information (24) such as ordered tests, test results, test analysis, prognosis, diagnostic information relating, etc., to that specific and particular patient (P). The first application (30) shares the patient context (12) with the second application (32). In the preferred embodiment the first application is in communication with the PACS data

15 base and the second application is in communication with the RIS data base, which databases (6, 8) are interconnected to the PACS broker (9).

Referring to Figs. 1 and 3, another embodiment of the patient data information system (10) includes a second workstation (68) coupled to the workstation (52) with the second workstation (68)

20 configured to operate the second application (32). An object request broker (80) allows the software application on one workstation to communicate with another software application operating on the second workstation or to communicate with two applications on the same workstation. To further facilitate the communication between two

25 applications, a bridge (70) is coupled between the second workstation (68) and the object request broker (80) wherein the second application (32) operating on the second workstation (68) communicates with the first workstation (52) via a Component Object Model (COM). The Component Object Model is a Microsoft Corporation specification which is

30 binary compatible with a C + + compiler v-table generator which

-8-

facilitates basic C++ classes. In operation, the first application (30) preferably is accessing and manipulating patient image data (16). A CORBA server (82) is a CORBA based interface to allow the first application to interface and communicate with other applications

5 operating on the system. CORBA is a common object request broker architecture specification adopted by software developers that uses an object orientated approach to create reusable software components. The CORBA server (82) creates an object in accord with the specification and upon which operations can be invoked by the first application. The

10 objects created by the CORBA server (82) correspond to certain actions that can be performed by the first application (30). In an event generator (84) operated with the first application is an event suite that is used to send notification of what the first application (30) is currently or has finished processing. The common object request broker architecture is

15 used to implement the communication layer between the several applications operating on the patient data information system (10). The common object request broker architecture provides an infrastructure that enables invocations of operations on objects created by the CORBA located anywhere on the network to which the workstation (52) is

20 connected as if that object was on the local workstation (52). The object request broker (80) facilitates the communication between the first application (30) and the second application (32). If the second application (32), typically the patient textual data (18) of a RIS data base (8), is created by CORBA a direct communication with the second application is

25 available through the object request broker (80). If the patient textual data (18) on the RIS data base (8) is created by the component object model a bridge (70) must then be invoked to translate between the component object model and the common object request broker architecture. This COM/CORBA bridge allows bi-directional messaging

30 between objects written using CORBA and those written using COM. The

-9-

bridge does the conversion between the two distributed objects in a seamless manner from the point-of-view of the user of the patient data information system (10).

5 Referring to Fig. 4, there is shown a flow chart of the integration process of the present patient data information system (10). A user logs onto the system at either the PACS workstation (52) or the RIS workstation (68) utilizing a user interface displayed on the monitor (52) of the display unit (50) of the workstation. Upon such login, a patient context (12) is created. The patient context (12) object is wrapped into an event by the event generator (84) and sent to the second application (32), typically the RIS application via the object request broker (80). If the RIS application is CORBA enabled it will receive and analyze the event and display the pertinent patient information based on the received patient context (12). If the RIS application is COM enabled, the event is translated from COM to CORBA using the bridge (70). A similar procedure is provided if the initiating logon occurs at a RIS workstation (68).

Fig. 5 is an example of a monitor screen on a workstation in the present patient data information system (10) displaying patient textual data (18) from a first application (30) and patient textual data (18) from a second application (32). The first application (30) in the illustration is from a PACS data base (6) and the second application (32) data is from a RIS data base (8).

Fig. 6 is an example of a screen on a monitor (54) of a workstation display unit (50). The first application (30) is displaying patient image data (16) and the second application (32) is displaying patient textual data (18).

Thus, there is provided a patient data information system that integrates patient data including patient image data and patient textual data in a patient context on a single workstation. While several

embodiments of the present invention have been disclosed and described in detail herein, various modifications may be made. For example, the preferred embodiment of the patient data information system was described in a Microsoft Corporation Windows NT environment. Other

5   networking operating systems can also be used to integrate the patient image data and patient textual data in a seamless fashion on a single workstation. By way of further modification, the communication between workstations, the PACS broker and the PACS and RIS data bases, can be facilitated by a wireless communication system or by an optical link

10   communication system. Such modifications and variations in use are intended to fall within the scope of the appended claims.

15